

## USB3 Vision

## Monochrome / Color CMOS Camera

STC-MBCM200U3V (2M, Monochrome)

STC-MCCM200U3V (2M, Color)

STC-MBCM200U3V-NIR (2M, Near IR)

STC-MBCM401U3V (4M, Monochrome)

STC-MCCM401U3V (4M, Color)

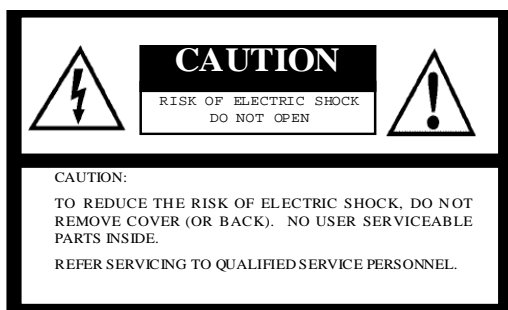
STC-MBCM401U3V-NIR (4M, Near IR)

## Product Specifications

Sentech Co., Ltd

## 1 Safety / Product Precautions

### Safety Precautions



For U.S.A.

Warning:

This equipment generates and uses radio frequency energy and if not installed and used properly, i.e., in strict accordance with the instruction manual, may cause harmful interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment.

For Canada

Warning:

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

WARNING:

TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

### Product Precautions

- Handle the camera with care. Do not abuse the camera. Avoid striking or shaking it. Improper handling or storage could damage the camera.
- Do not pull or damage the camera cable.
- During camera use, do not wrap the unit in any material. This will cause the internal temperature of the unit to increase.
- Do not expose the camera to moisture, or do not try to operate it in wet areas.
- Do not operate the camera beyond its temperature, humidity and power source ratings.
- While the camera is not being used, keep the lens or lens cap on the camera to prevent dust or contamination from getting in the sensor or filter area and scratching or damaging this area.
- Do not keep the camera under the following conditions:
  - In wet, moist, and high humidity areas
  - Under hot direct sunlight
  - In high temperature areas
  - Near an object that releases a strong magnetic or electric field
  - Areas with strong vibrations
- Apply the power that satisfies the requirements specified in this document to the camera.
- Use a soft cloth to clean the camera. Use pressured air spray to clean the surface of the glass. DO not scratch the surface of the glass.

- The camera is a general-purpose electronic device; using the camera for the equipment that may threaten human life or cause dangers to human bodies directly in case of failure or malfunction of the camera is not guaranteed. Use the camera for special purposes at your own risk.
- Defect pixels may appear due to the sensor characteristics.
- During camera use, do not plug or unplug other USB devices (USB storage, etc.). Plugging or unplugging other devices may result in a failure to recognize the USB camera.
- Increasing gain level also increases the noise level.
- **The noise level remarkably increases in the long exposure mode.**

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## 2 Overview

This document describes the specification of the following cameras.

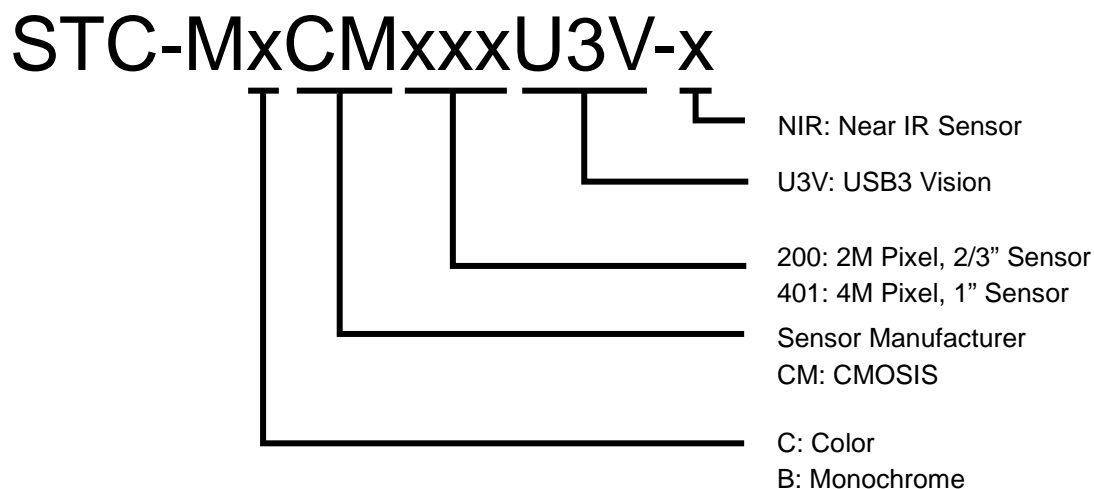
STC-MBCM200U3V / MCCM200U3V / MBCM200U3V-NIR (2M)  
STC-MBCM401U3V / MCCM401U3V / MBCM401U3V-NIR (4M)

### 2.1 Features

- USB3 Vision
- Frame Rate(Full Scan) :167fps@2M, 89fps@4M
- CMOS Global
- Up to 64 Pixel Defect Correction (Default: ON)
- 8bit,10bit, 12bit output

### 2.2 Item Numbers Naming Method

Each digit of the camera item numbers has the following designations.



**Figure 1. Naming Method**

### 3 Specifications

#### 3.1 Electronic Specifications (STC-MCCM200U3V/STC-MBCM200U3V)

**Table 1. Electronic Specifications (STC-MCCM200U3V/STC-MBCM200U3V)**

Model Number		STC-MCCM200U3V	STC-MBCM200U3V
Image Sensor		2/3" 2M pixel Color CMOS (CMOSIS: CMV2000)	2/3" 2M pixel Monochrome CMOS (CMOSIS: CMV2000)
Active Picture Elements		2048(H) x 1088(V)	
Cell Size		5.5 (H) x 5.5 (V) $\mu$ m	
Scanning System		Progressive	
Shutter Type		Global Shutter	
Scanning Mode		Full Scanning, Variable ROI (Horizontal and Vertical)	
Maximum Frame Rate (in Full Scanning Mode)		2M: 2048 x 1080: 167 fps (Raw8 bit), 84 fps (Raw10 bit) , 70 fps (Raw12 bit) *Frame rate will drop if connected with the USB2.0 port	
Maximum Frame Rate (in AOI Mode)		1280 x 1024: 177fps, 640 x 480: 370fps, Minimum AOI (32 x 32): 3500 fps	
Sync. System		Internal	
Video Output Format		RAW8bit / 10bit /12bit (Default: RAW8bit)	RAW8bit / 10bit /12bit (Default: RAW8bit)
S/N Ratio (8bit)		Less than 3 digit (Gain 0 dB)	
Sensitivity *7		517 Lux	283 Lux
Electronic Shutter		Preset • Free-run Mode: Exposure Time 22 usec to 16 sec (in full scanning mode) Preset • Trigger Mode: Exposure Time 22 usec to 16 sec (in full scanning mode)	
Gain	Analog	No support	
	Digital	0 ~ 13.9 dB (Default 0dB)	
Offset	Analog	0 to 255 digit (for 12bit/pix data) 8bit: 0 to 15digit	
ROI *5		ROI (Horizontal : 32 to 2048 pixels / Vertical : 32 to 1088 lines) (Default: 2048 x 1088) Adjustable Steps for offset: 2 pixels in horizontal direction and 2 lines in vertical direction *1 Adjustable Steps for image size: 16 pixels in horizontal direction and 4 lines in vertical direction Adjustable Steps for ROI 8 Region, 16 pixels in horizontal direction and 4 lines in vertical direction *2	
Binning Function *3		N/A	Individual x2, x4 Horizontal, Vertical Binning (Frame rate does not increase)
Decimation Function *3		x2, x4 Vertical Decimation	Individual x2, x4 Horizontal, Vertical Decimation (Frame rate might be increased on Vertical, Frame rate might not be increased on Horizontal)
ALC		AE,AGC (Default AE:OFF, AGC:OFF)	
White Balance		Auto, Manual, One Push (Default: Manual)	N/A
HDR		N/A	Support
Mirror Image		Horizontal / Vertical / Horizontal and Vertical (Default: OFF)	
Pixel Defect Correction		Up to 64 pixels (Default: ON)	
Operational Mode *4		Free-run / Edge-preset Trigger / Pulse width trigger	
User Setting Storage		Support	
Interface		USB3.0 Super speed (USB3.0 Micro B)	
Input/Output		Three GPIO, One Camera Hardware Reset	
Power *6	Input Voltage	+5V(typ.) (Conform to USB Standard)	
	Consumption	Less than 4 W	

As for the detail of \*1,\*2,\*3,\*4,\*5,\*6,\*7 please refer to the [another page](#).

### 3.2 Electronic Specifications (STC-MCCM401U3V/STC-MBCM401U3V)

**Table 2. Electronic Specifications (STC-MCCM401U3V/STC-MBCM401U3V)**

Model Number		STC-MCCM401U3V	STC-MBCM401U3V
Image Sensor		1" 4M pixel Color CMOS (CMOSIS: CMV4000)	1" 4M pixel Monochrome CMOS (CMOSIS: CMV4000)
Active Picture Elements		2048(H) x 2048(V)	
Cell Size		5.5 (H) x 5.5 (V) $\mu\text{m}$	
Scanning System		Progressive	
Shutter Type		Global Shutter	
Scanning Mode		Full Scanning, Variable ROI (Horizontal and Vertical)	
Maximum Frame Rate (in Full Scanning Mode)		4M: 2048 x 2048: 89fps (Raw 8bit), 45fps(Raw10bit), 37fps(Raw12bit) *Frame rate will drop if connected with the USB2.0 port	
Maximum Frame Rate (in AOI Mode)		1280 x 1024: 177fps, 640 x 480: 370fps, Minimum AOI (32 x 32): 3500 fps	
Sync. System		Internal	
Video Output Format		RAW8bit / 10bit /12bit (Default: RAW8bit)	RAW8bit / 10bit /12bit (Default: RAW8bit)
S/N Ratio (8bit)		Less than 3 digit(Gain 0 dB)	
Sensitivity *7		517 Lux	283 Lux
Electronic Shutter		Preset • Free-run Mode: Exposure Time 22 usec to 16 sec (in full scanning mode) Preset • Trigger Mode: Exposure Time 22 usec to 16 sec (in full scanning mode)	
Gain	Analog	No support	
	Digital	0 ~ 13.9 dB (Default 0dB)	
Offset	Analog	0 to 255 digit (for 12bit/pix data) 8bit: 0 to 15digit	
ROI *5		ROI (Horizontal : 32 to 2048 pixels / Vertical : 32 to 2048 lines) (Default: 2048 x 2048) Adjustable Steps for offset: 2 pixels in horizontal direction and 2 lines in vertical direction *1 Adjustable Steps for image size: 16 pixels in horizontal direction and 4 lines in vertical direction Adjustable Steps for ROI 8 Region, 16 pixels in horizontal direction and 4 lines in vertical direction *2	
Binning Function *3		N/A	Individual x2, x4 Horizontal, Vertical Binning (Frame rate does not increase)
Decimation Function *3		x2, x4 Vertical Decimation	Individual x2, x4 Horizontal, Vertical Decimation (Frame rate might be increased on Vertical, Frame rate might not be increased on Horizontal)
ALC		AE,AGC (Default AE:OFF, AGC:OFF)	
White Balance		Auto, Manual, One Push (Default: Manual)	N/A
HDR		N/A	Support
Mirror Image		Horizontal / Vertical / Horizontal and Vertical (Default: OFF)	
Pixel Defect Correction		Up to 64 pixels (Default: ON)	
Operational Mode *4		Free-run / Edge-preset Trigger / Pulse width trigger	
User Setting Storage		Support	
Interface		USB3.0 Super speed (USB3.0 Micro B)	
Input/Output		Three GPIO, One Camera Hardware Reset	
Power *6	Input Voltage	+5V(typ.) (Conform to USB Standard)	
	Consumption	Less than 4 W	

As for the detail of \*1, \*2, \*3, \*4, \*5, \*6., please refer to the [another page](#).

## Precautions

- \*1 Binning/ Decimation unit does not change.
- \*2 Several regions can not be set on the same horizontal line.
- \*3 Binning/ Decimation can not work simultaneously.
- \*4 Do not input the trigger frequently than maximum frame rate.

If trigger was inputted during sensor ReadOut timing, ReadOut will be interrupted. This trigger caused exposure end.

As for the ROI, please refer to [another chapter](#).

- \*6 When user connect this camera with USB2.0 port. Please use this USB3 camera with considering power consumption. USB3 camera offer the larger current than USB2.
- \*7 Procedure of Sensitivity measurement is as following condition  
Measure the luminance when white level achieved 100% on F5.6

Camera Setting		Environment	
Parameter	Setting	Parameter	Setting
Gain Up	0 db	Light Source	Light Box(White)
AGC	OFF	Color temperature	5100K
White Balance	Optimum	Exposure Time	1/30
Electrical Shutter	1/30	F on Lens	F 5.6
Black Level	Optimum	Target Luminance	Illuminometer
Gamma	Factory Setting		

## How to obtain full frame rate

This general guideline might help to obtain the full frame rate (2M:167fps,4M:89fps) from the camera.

To output the full frame rate(2M:167fps,4M:89fps), the data transfer speed on USB bus is depends on capability of host controller.

Renesas/Fresco Logic 's host controller improved data transfer speed drastically on the second generation, Intel chipset improved transfer speed faster than 10 to 20 %. To obtain the image on maximum frame rate, Intel chipset (Intel 7/8 Series) should be used. This camera has very high speed sensor. Another host controller might cause the lower frame.

When PCIExpress board of USB3.0 interface is used, please insert the PCIExpress Gen2.0(5.0[GT/s]) slot. If non-PCIExpress Gen2.0(5.0[GT/s]) is used, data transfer speed could decrease about 50%.

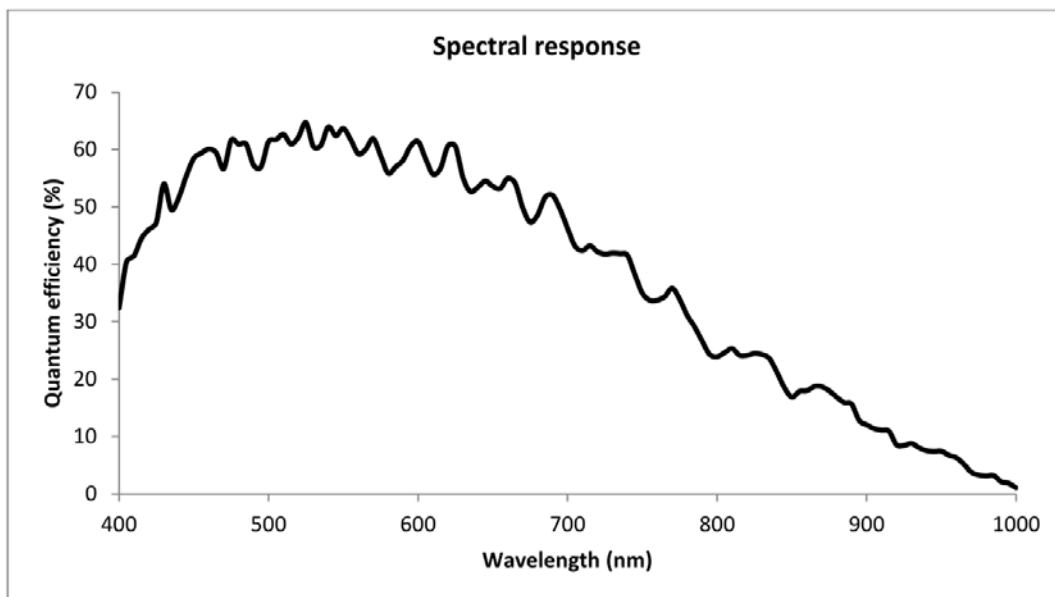
If incapable host controller cause the lower frame rate, camera frame rate should be set lower than maximum to adjust incapable host controller spec. It might erase the issue.

Since huge data transfer into the PC, Image processing on the PC (like color interpolation, image viewing) eat up the PC resource and cause the lower frame rate also.

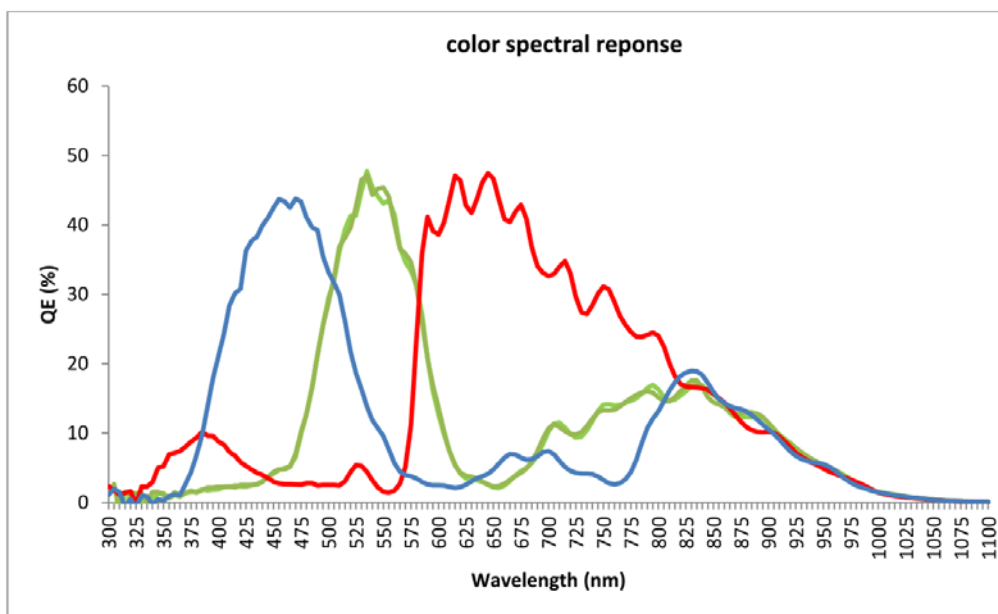


## 3.3 Spectral Sensitivity Characteristics

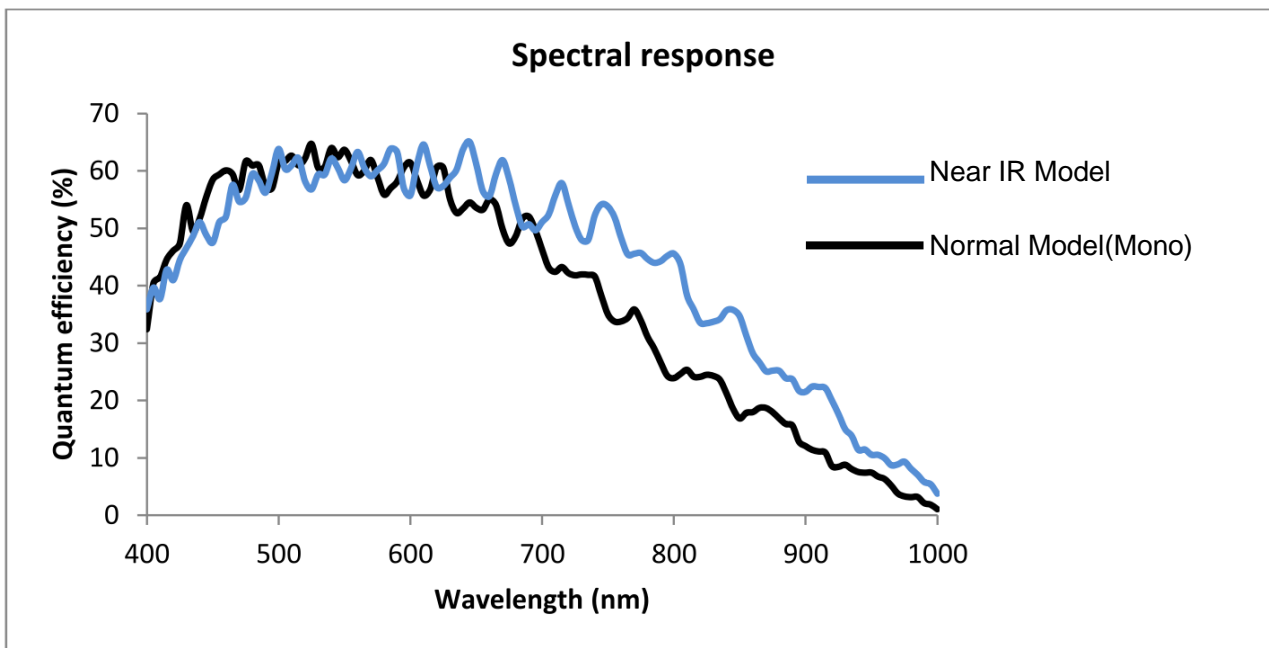
### 3.3.1 STC-MBCM200U3V / STC-MBCM401U3V



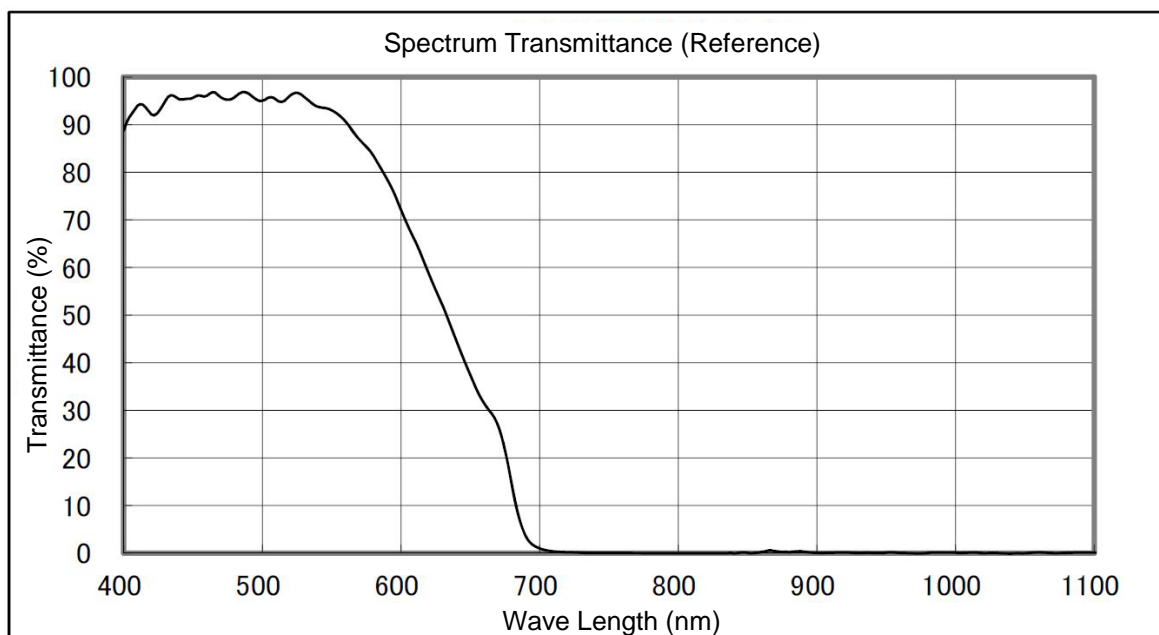
### 3.3.2 STC-MCCM200U3V / STC-MCCM401U3V



### 3.3.3 STC-MBCM200U3V-NIR / STC-MBCM401U3V-NIR (Near IR model)



### 3.4 Filter Specification(STC-MCCM200U3V / STC-MCCM401U3V)



## 3.5 Mechanical Specifications

**Table 3. Mechanical Specifications**

Model Number	STC-MCCM200U3V/MCCM401U3V	STC-MBCM200U3V/MBCM401U3V
Dimensions	C Mount: 28 (W) x 28 (H) x 40 (D) mm *excluding the connectors	
Lens Mount	C Mount	
Optical Filter	IR Cut Filter	No IR Cut Filter
Optical Center Accuracy	Positional accuracy in Horizontal and Vertical directions: +/- 0.31 mm Rotational accuracy of Horizontal and Vertical: +/- 1.5 deg.	
Weight	Approximately 52 g	
Interface Connectors	USB Connector: USB3.0 Micro B type I/O Connector: HR10A-7R-6PB (Hirose) or equivalent	

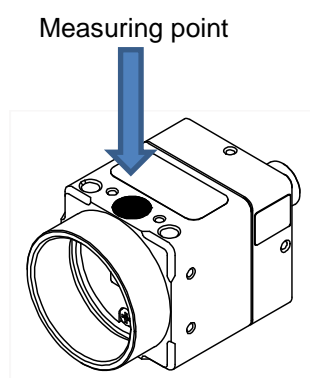
## 3.6 Environmental Specifications

**Table 4. Environmental Specifications**

Model Number		STC-MCCM200U3V/MBCM200U3V STC-MCCM401U3V/MBCM401U3V
Operational Temperature	Minimum	Environmental Temperature: 0 deg. C
	Maximum	Camera housing temperature (top plate) shall not exceed 55 deg. C *1
Storage Temperature		Environmental Temperature: -30 to +65 deg. C, Environmental Humidity: 0 to 85%
Vibration		20Hz to 200Hz to 20Hz (5min./cycle), acceleration 10G, XYZ 3 directions 30 min. each
Shock		Acceleration 38G, half amplitude 6ms, XYZ 3 directions 3 times each
Standard Compliance		EMS: EN61000-6-2, EMI: EN55011
RoHS		RoHS Compliant

\*1:Please install the camera with appropriate heat dissipation. If camera is mounted lens and tripod like aluminum plate, it could decrease the camera housing temperature for heat dissipation. When internal temperature sensor on the camera shows less than 63 deg C, camera housing temperature(top plate) would be less than 55 deg. It could be the guideline.

### Upper side of camera



## 3.7 Power/IO Connector

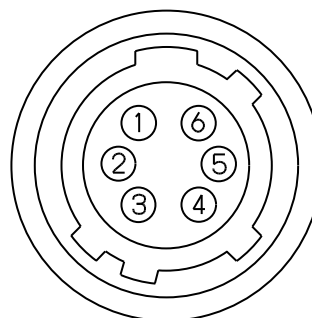
HR10A-7R-6PB (Hirose) or equivalent.

This connector is for input and output signals.

The trigger input and sync input /output signals can be assigned through the camera setting communication. As for the cable part(Female connector), HR10A-7P-6S (Hirose) or equivalent can be used.

### 3.7.1 Pin assignment

Pin No.	Signal Name	IN/OUT
1	IO_GND	-
2	GPIO2	IN/OUT
3	GPIO1	IN/OUT
4	GPIO0	IN/OUT
5	CAM_RESET	IN
6	N.C.	-



\*Possible Maximum Rated Voltage is +24V.on CAM\_RESET,GPIO0,GPIO1,GPIO2.

\*Please electrically "OPEN" on NC (Pin 6).

### 3.7.2 Input Output DC characteristics

Pin No.	Signal Name	Function	IN/OUT	Voltage			Current	Reference
					Low Voltage	High Voltage		
1	IO_GND	GND	-				-	-
2	GPIO2	General Purpose Input Output	IN/OUT	IN	Less than+1.00V	+3.00 to +24V	4uA(typ.)(*4)	2
				OUT	0 to +2.20V(*1)	+3.00 to +24V(*2)	15mA(Max.)(*3)	3,4
3	GPIO1	General Purpose Input Output	IN/OUT	IN	Less than+1.00V	+3.00 to +24V	4uA(typ.)(*4)	2
				OUT	0 to +2.20V(*1)	+3.00 to +24V(*2)	15mA(Max.)(*3)	3,4
4	GPIO0	General Purpose Input Output	IN/OUT	IN	Less than+1.00V	+3.00 to +24V	4uA(typ.)(*4)	2
				OUT	0 to +2.20V(*1)	+3.00 to +24V(*2)	15mA(Max.)(*3)	3,4
5	CAM_RESET	Camera Hardware Reset	IN	IN	Less than +0.80V	+3.00 to +24V	4uA(typ.)(*4)	1
6	N.C.	NC	-	-			-	-

\*1: The case that output low voltage on 15mA load, if current on IO port is large when low voltage output, output voltage could be higher for internal register. Please evaluate carefully on the actual system.

\*2: The maximum charging voltage that is connected IO When external IO port is connected. Equivalent VCCext on Reference 4.

\*3: When external IO port is connected, control the currenecy less than 15mA on IO port.

\*4: This value is typical current value when High voltage input into Input port.

### 3.7.3 Default Setting of Input Output

Pin No.	Signal Name	Default	
		IN/OUT	Setting
2	GPIO2	IN	Disable
3	GPIO1	IN	Disable
4	GPIO0	IN	Disable

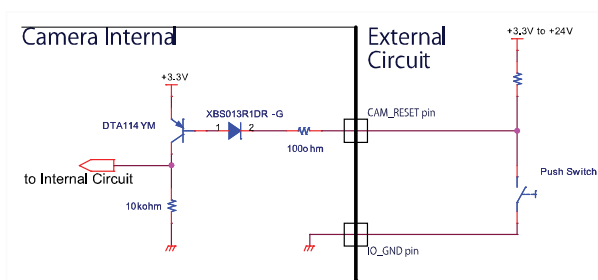
### 3.7.4 GPIO Circuit (Input)

#### Input Signal Functions

No.	Function	Polarity
1)	Disable (Default)	-
2)	General Input	-
3)	Trigger Input	Positive or Negative

- 1) Disable  
Set when no input signal is necessary.
- 2) General Input  
Set high or low level and the user can check the status on the software.
- 3) Trigger Input  
Use this function for the trigger signal in the edge preset mode.

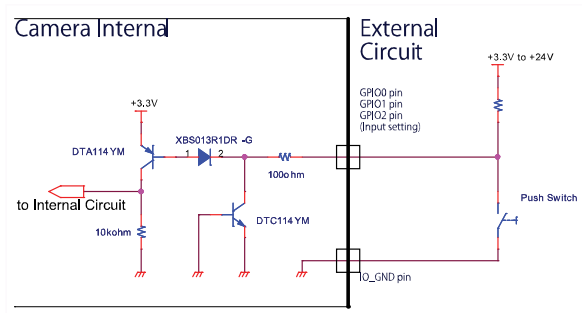
#### CAM\_RESET(Reference 1)



Camera can be reset after connecting the GND in 5 seconds on this circuit. \*1

\*1: Hardware Reset should be set from OFF(Default) to ON is necessary.

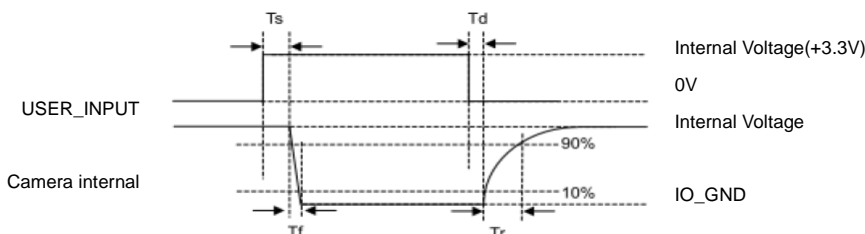
#### General Purpose Input (Reference 2)



## Input Response Characteristics

Response characteristics of CAM\_RESET(Reference1), General Purpose Input (Reference 2) are as follows diagram.

Td	0.06 usec
Tr	0.07 usec
Ts	4.06 usec
Tf	3.90 usec



Capable input trigger's pulse width is

Positive Edge: more than  $T_s + T_f$

Negative Edge: more than  $T_d + T_r$

## 3.7.5 GPIO Circuit (Output)

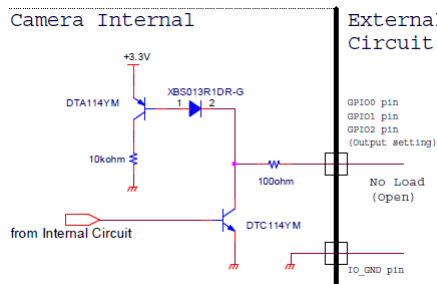
### Output Signal Functions

No/	Function	Polarity
1)	Disable (Default)	-
2)	General Output	-
3)	Trigger Output (Programmable)	Positive or Negative
4)	Trigger Output (Loop Through)	Positive or Negative
5)	Exposure End	Positive or Negative
6)	CCD Read End Output	Positive or Negative
7)	Strobe Output (Programmable)	Positive or Negative
8)	Strobe Output (Exposure)	Positive or Negative
9)	Trigger Valid Out	Positive or Negative
10)	Transfer End	Positive or Negative

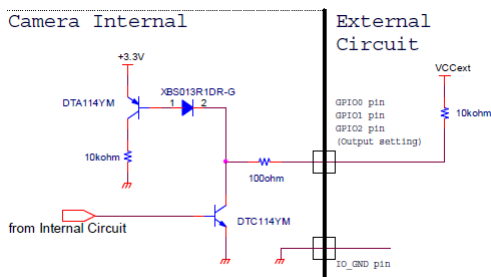
- 1) Disable  
Set when no output signal is necessary.
- 2) General Output  
Outputs high or low level signal set on the software.
- 3) Trigger Output (Programmable)  
Outputs the trigger input signal with pulse delay setting and pulse duration applied.
- 4) Trigger Output (Loop Through)  
Outputs the trigger input signal (with a slight internal delay).
- 5) Exposure End  
Outputs with pulse delay setting and pulse duration applied when exposure completed.

- 6) CCD Read End Output  
Outputs with pulse delay setting and pulse duration applied when one frame transfer from sensor completed.
- 7) Strobe Output (Programmable)  
Outputs with strobe delay setting and strobe duration applied when trigger input signal received.
- 8) Strobe Output (Exposure)  
\*Actual exposure duration = Output Pulse Width + Minimum Exposure Time 22 usec
- 9) Trigger Valid Out  
With the positive polarity setting, high status indicates that the input trigger signal is acceptable. This signal becomes low from the exposure start to the end of image output.  
With the negative polarity setting, low status indicates that the input trigger signal is acceptable. This signal becomes high from the exposure start to the end of image output.
- 10) Transfer End  
Outputs with pulse delay setting and pulse duration applied when one frame transfer from camera completed.

## General Purpose Output (Reference 3)



## General Purpose Output (Reference 4)



## Characteristics of the output signals

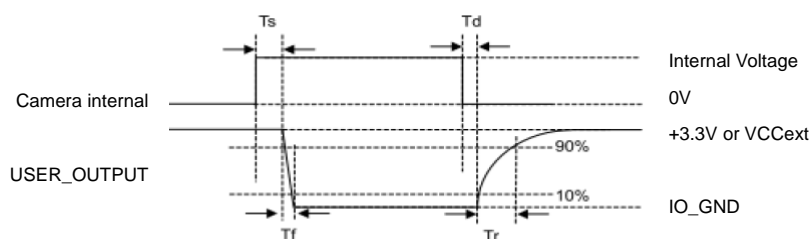
Response characteristics of General Purpose output (Reference 3), General Purpose output (Reference 4) are as follows diagram. Pulse width is configurable through software.

Please refer to as follows response timing table, and design with affordable timing for the setting of this output pulse width does not include this characteristics.

	VCCext			
	OPEN(*1)	5V (*2)	12V (*2)	24V (*2)
Td	2.76 usec	2.73 usec	2.70 usec	2.63 usec
Tr	12.27 usec	1.56 usec	1.48 usec	1.43 usec
Ts	0.06 usec	0.07 usec	0.08 usec	0.09 usec
Tf	0.05 usec	0.07 usec	0.11 usec	0.16 usec

\*1: Reference 3. Measured on +3.3V internal Voltage.

\*2: Reference 4





## 3.1 Detail of Camera Function

### 3.1.1 ROI

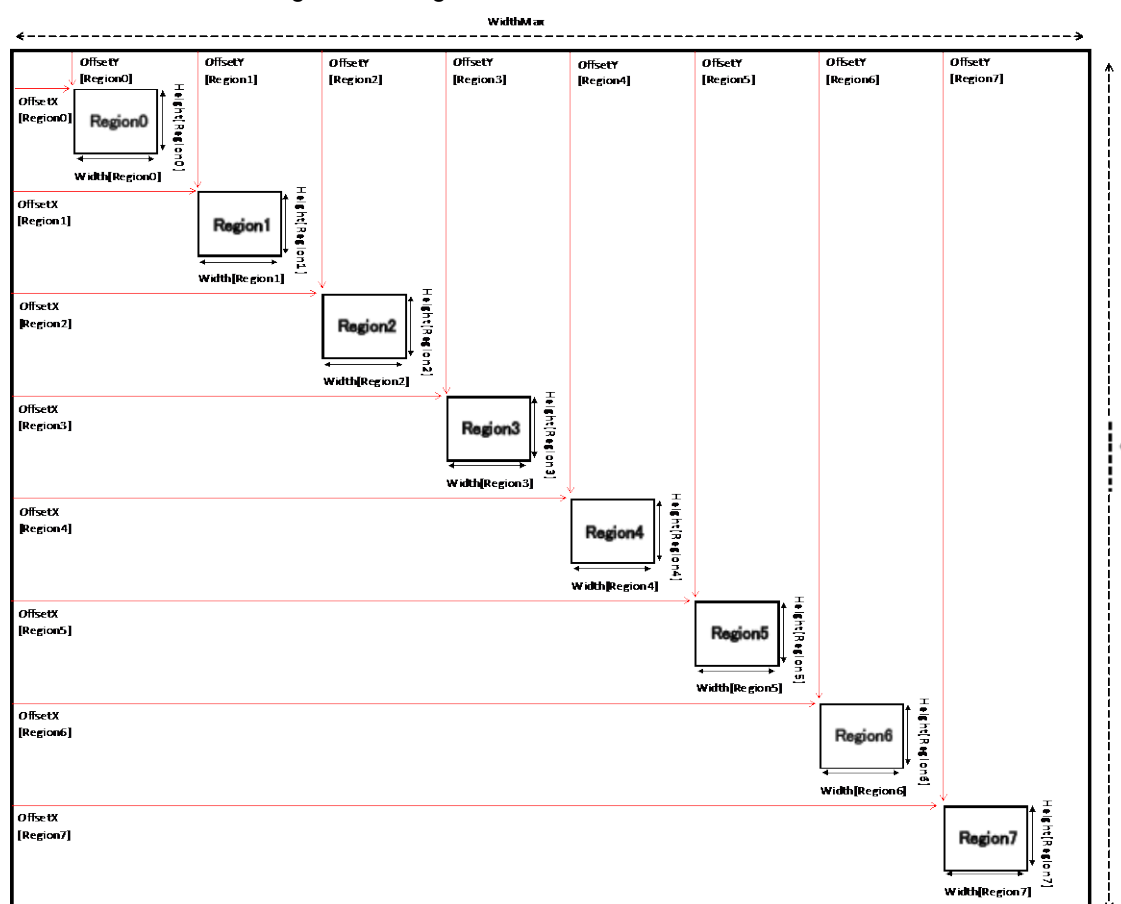
When user use ROI function, please follow theses precautions as bellow.

The image data format on MultiROI is Sentech' s original format. This data does not follow USB3Vision format. Therefore MultiROI function does not work on 3rd party' s USB3Vision compliance application.

If user use MultiROI function, as follows application should be required.

- The application based on Sentech' s SDK(Standard/Trigger)
  - The application based on Sentech' s DirectShowFilter
  - The application based on Sentech' s GenTL module(※)
- ※ Implement the process for Sentech' s original format in the user' s application is necessary.

MultiROI can be set 8 regions as Region0~7.



Region number from 0 to 7 should be set from top of image. Several regions can not be set on the same horizontal line.

ON/OFF can be assigned for each region.

Replacing the region is prohibit.

Please set the smaller setting on smaller region than bigger region setting.

Overlap image for each region is prohibit.

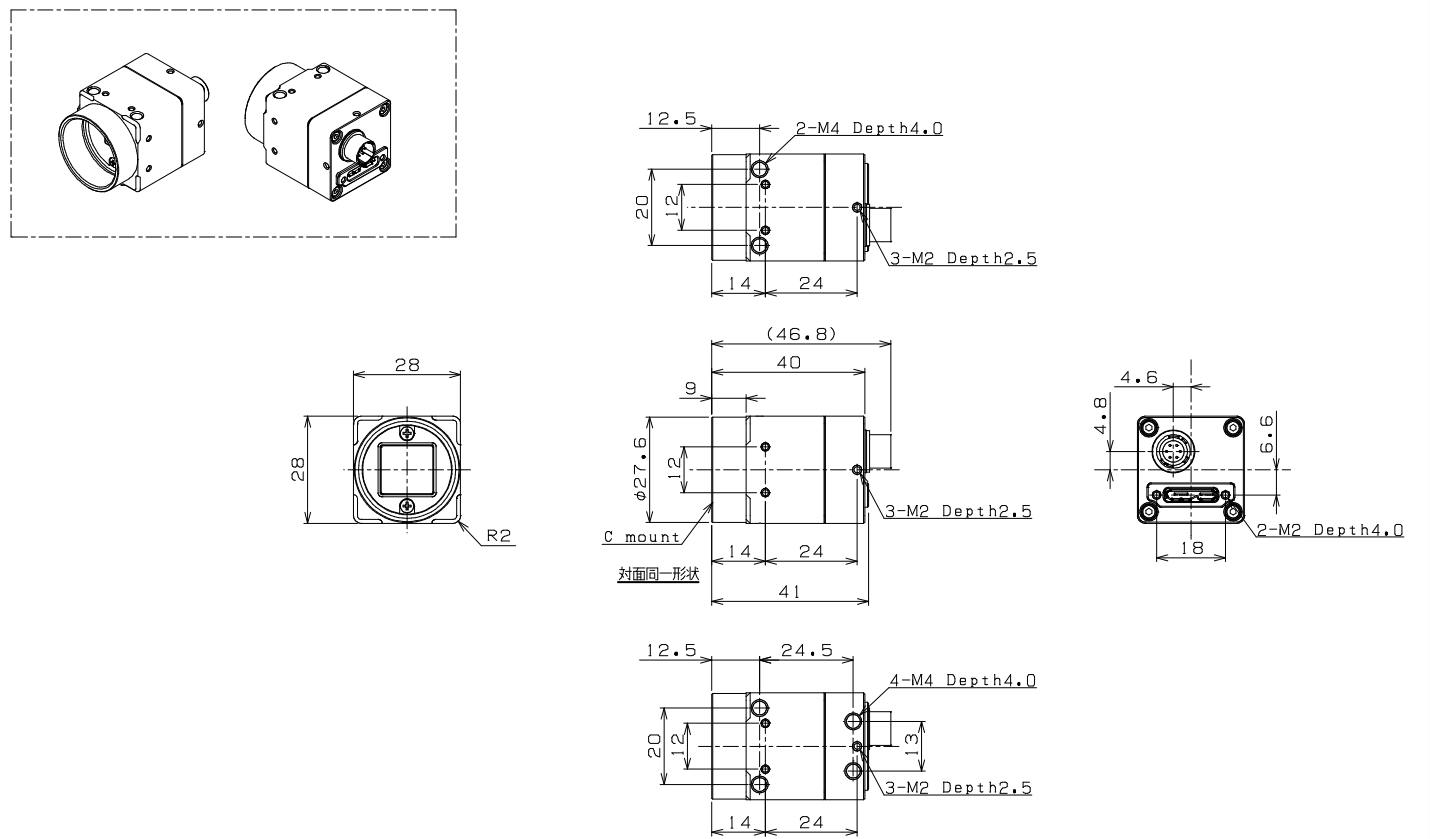
Region number 0 to 7 should be assigned rotated image when Horizontal / Vertical / Horizontal and Vertical setting is used on the camera.

This camera output all of active region's image as one image data.

Width and Height is corresponding obtained image size.

When Binning/Decimation is enabling, after Binning/Decimation size should be corresponding.

4 Dimensions



Unit: mm

## 5 Revision History

Rev	Date	Changes	Note
00	2014/08/01	● New document	
01	2014/08/25	● Update Revised information on 2M model Added formula of ROI	
02	2014/10/10	● Update Added Power Consumption on 2M model, Storage Temperature Revised Lower Operational Temperature	
03	2014/12/17	● Update Added S/N Ratio, Sensitivity(switch from Minimum Scene Illumination)	
04	2015/02/05	● Update Added explanation of Sensitivity	
05	2015/03/03	● Revised Deleted: 12Vdc power input Added: *4 on Input Output DC characteristics Revised: Reference 1,2 on GPIO Circuit (Input)	

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